BRITISH COLUMBIA.

REPORT

ON AN

EXPLORATORY SURVEY FOR A LINE OF RAILWAY

TO CONNECT THE

CANADIAN PACIFIC RAILWAY WITH BARKERVILLE,

CARIBOO DISTRICT.

BY H. P. BELL, M.I.C.E., Mem. Am. Soc. C.E.

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PLAN
Shewing the different routes
connecting the
C. P. R.
with
THE MINING DISTRICT
OF
CARIBOO
BY
PROPOSED RAILWAY.
ASHCROFT
CACHE CREEK
BONAPARTE RIVER
CLINTON
THE CHASM
Canadian Pacific Railway
KAMLOOPS LAKE
VAN HORNE
SAVONA
KAMLOOPS
PLATEAU
Undulating, Partially Timbered
Grazing Country.
3000 to 4000 Feet above SEA LEVEL.
Magnetic North 24° 15'
NORTH THOMPSON RIVER
Can. Pac. Ry. Survey of 1877.
Observed Lat. 51° 14' 12"
Forks of the Bonaparte
Undulating Grazing Country.
BRIDGE CREEK
Overlapping Points and Rock Ranges.
Undulating Plateau good timber and open patches.
Captain Mitchell's Trail to Cariboo Mines.
Open Valley
Observed Lat. 51° 14' 12"
Can. Pac. Ry. Survey of 1877.
CANIM LAKE
MAHOOD LAKE
BLACK WATER
CONFLUENCE OF THE NORTH THOMPSON AND CLEARWATER RIVERS.
CLEARWATER RIVER
Partially open country with good summer ranges for cattle
FRASER RIVER
QUESNELLEMOUTH
BEAVER RIVER
QUESNELLE RIVER
QUESNELLE FORKS
SOUTH FORK QUESNELEE
HORSEFLY RIVER
QUESNELLE LAKE
BARKERVILLE
Peace River Extension.
ANTLER CREEK
Magnetic North 22° 0'
Distance from Savona's Ferry to Barkerville via the Bonaparte River..... 238 Miles.
" " Kamloops via North Thompson and St Joseph's Creek to Barkerville..... 300 "
" " " " " Clearwater River to " ..... 344 "
These Distances to per cent over those marked on Plan
to compensate for local curvature.
SCALE 20000 Feet equal One Inch.
Higgins Lith. Co. The Colonist Victoria, B.C.

REPORT.

VICTORIA, B. C.,
April 23rd, 1887.

Hon. F. G. Vernon,
Chief Commissioner of Lands and Works
for the Province of British Columbia:

SIR,—On the 22nd of November, 1886, I had the honour of receiving a letter, of which the following is a copy:—

"VICTORIA, B. C.,
"22nd November, 1886.

"SIR,—Adverting to the conference I have had with you, respecting a route by which a "line of railway might be constructed to connect the gold mining regions of Cariboo with the "main line of the Canadian Pacific Railway, I have the honour to instruct you to proceed "forthwith to make such reconnaissance surveys as will enable the Government to form an "opinion as to the preferable route. One line by way of the Bonaparte river, and another "by way of the North Thompson, has been mentioned as offering the most favourable routes "for a line of railway; and I would request you to make a careful examination of each of these "proposed routes, taking such notes of distance, elevations, requisite bridging, rock-work, &c., "&c., as may be necessary to prepare a comparative estimate of the cost of construction. You "will please make a note of and report upon any circumstance which may have a bearing on "the subject. Your survey should be conducted with dispatch, and without incurring un-"necessary expense.

"I am, &c.,
"*H. P. Bell, Esq.* (Signed) "WM. SMITHE."

Under these instructions I left Victoria on November 23rd, 1886, went through to Barkerville, and returned to Victoria February 9th, 1887, having accomplished the object of those instructions, so far as outdoor operations, then practicable, are concerned. I have now the honour to submit, herewith, a diagram of average grades, a profile of the Canadian Pacific Railway survey of 1873, up the Bonaparte river and down St. Joseph's creek to the North Thompson river, and a plan of the routes referred to in those instructions.

I have marked upon this plan the date of the day upon which each camp was broken up; and I shall hereafter refer to the physical features of the ground passed over, in so far as it may be necessary to carry out the instructions received.

Knowing, from former observations, that any practicable line would be necessarily circuitous, I foresaw the utility of making a continuous track survey, in order to define, with practicable accuracy, the length of a line between terminal points. The instruments used for this purpose were the watch, the magnetic compass, the mariner's sextant, and aneroid barometers. The principle involved in a survey of this kind, is the future correction of errors in estimated distance (made possible by observation of latitude) where the true course is sufficiently near the meridian to admit of this method being used.

The late Chief Commissioner of Lands and Works had applied to Mr. Collinwood Schrieber, Chief Engineer and General Manager of Canadian Government Railways, Ottawa, for tracings of certain surveys up the Bonaparte river, made for the Canadian Pacific Railway survey by E. W. Jarvis, under the direction of Mr Marcus Smith, in 1873. These tracings were received in Victoria on March 28th, 1877. That portion of the instrumental survey of E. W. Jarvis overlapping the track survey herewith, confirms the accuracy of the latter within reasonable limits.

You will see that the points covered by the instructions furnished, stand in the following order of precedence:—

(1.) The line by way of the Bonaparte river;
(2.) The line by way of the North Thompson river;
(3.) The relative cost of their construction.

Before describing the routes laid down upon plan herewith, it will be in order to give a general description of the physical features of the region under consideration, and to this end, I have extracted the following from the report of Mr. Sanford Fleming, C. E., C.M.G., on the Canadian Pacific Railways, dated 1874. He says—

"Between the Cascade and the Rocky Mountain chains, there extends an elevated plateau, "averaging from a little under 3,000 to fully 4,000 feet above sea level.

"This plateau is grooved out by deep river channels, broken by rocky ridges and inferior "mountain masses. It has many lakes occupying deep depressions in its surface, and is inter- "sected in many directions by numerous broad sheltered undulating valleys. The surface of "this plateau in some quarters is thickly, at others scantily, timbered, and in some districts "open prairies present themselves."

Elsewhere in the same report Mr. Fleming says—

"Immediately on the western flank of the main Rocky Mountain chain, are found high "mountain masses in independent groups, and known by local names, such as Cariboo, Selkirk, "and Gold ranges."

The last description may be taken as the geographical complement for the north end of the region referred to in the description immediately preceding.

Taking now the points referred to in order of numeration, the first is the line by way of the Bonaparte River.

GENERAL DESCRIPTION OF BONAPARTE ROUTE

This line is laid down with its southern terminus at Port Van Horne, in preference to Ashcroft. A line terminating at the latter place would be subject to the disibality of four miles of grade, at the rate of about 120 feet per mile; probably two tunnels, of about 1,000 feet each in length, with numerous quick curves, resulting in about six miles of heavy work with a low standard of economical traffic capacity.

It is, however, possible that a junction might be made with the Canadian Pacific Railway, at some point between Savona's Ferry and Ashcroft, without the employment of any heavy grades. If this were found possible by instrumental survey, it would shorten the length of the Bonaparte route by the distance saved between Port Van Horne and the point so selected as the southern terminus of the Cariboo Railway.

The difference of cost between a line from Cache Creek to Ashcroft, and one from Cache Creek to the south terminal point wherever situated, is not worthy of consideration when the difference of economical traffic capacity is taken into capital account.

That portion of the line up the Bonaparte river going north from the 124th mile post on the waggon road (Mundorf's farm), surveyed by E. W. Jarvis in 1873, is thus described in the report of the Canadian Pacific Railway surveys in British Columbia by Mr. Marcus Smith:

"The last point is 1,832 feet above sea level, and thence 24 miles up the valley the grades "are tolerably uniform, at the rate of 31 feet per mile; the only variations being one of 73 "feet per mile for two and a half miles, and a few short lengths of 53 feet per mile.

"The works throughout this length will be light; for although the slopes of the valley are "rock, with a thin covering of soil, the line can be kept close to the bottom flats, avoiding any "deep cutting.

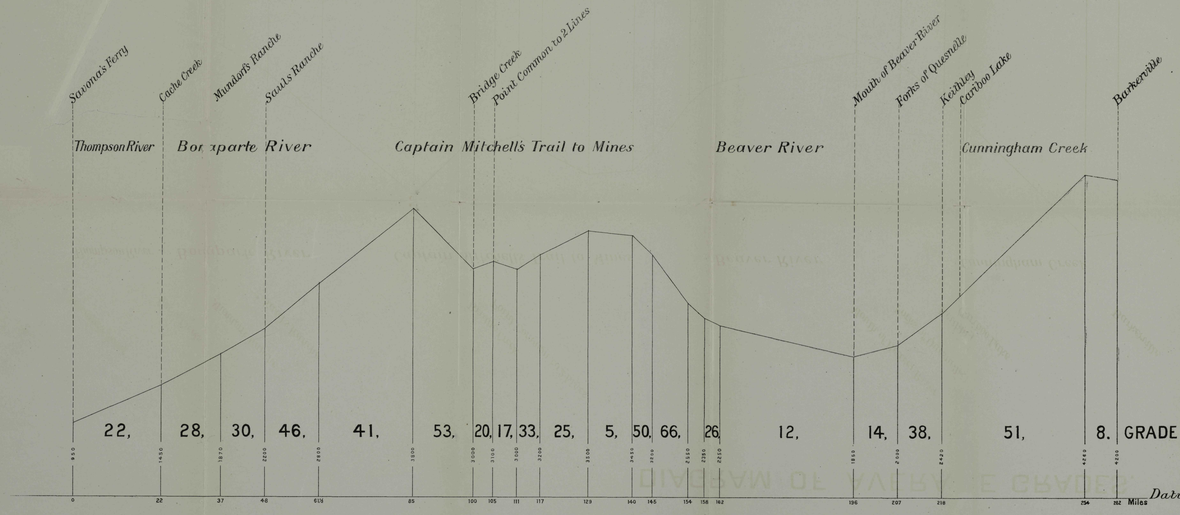
"Thence for three miles and a quarter, to the head waters of the Bonaparte, the rise is at "the rate of two feet per 100, through a narrow valley, with much loose rock on its slopes; "in this the work will be rather heavy.

"We have now reached an altitude of 3,372 feet above sea level, in a broad open basin or "depression in the great central plateau of British Columbia, the Bonaparte river flowing "gently through a chain of lakes or beaver dams. The rise in the next 12 miles is only 122 "feet per mile, and the work will be very light."

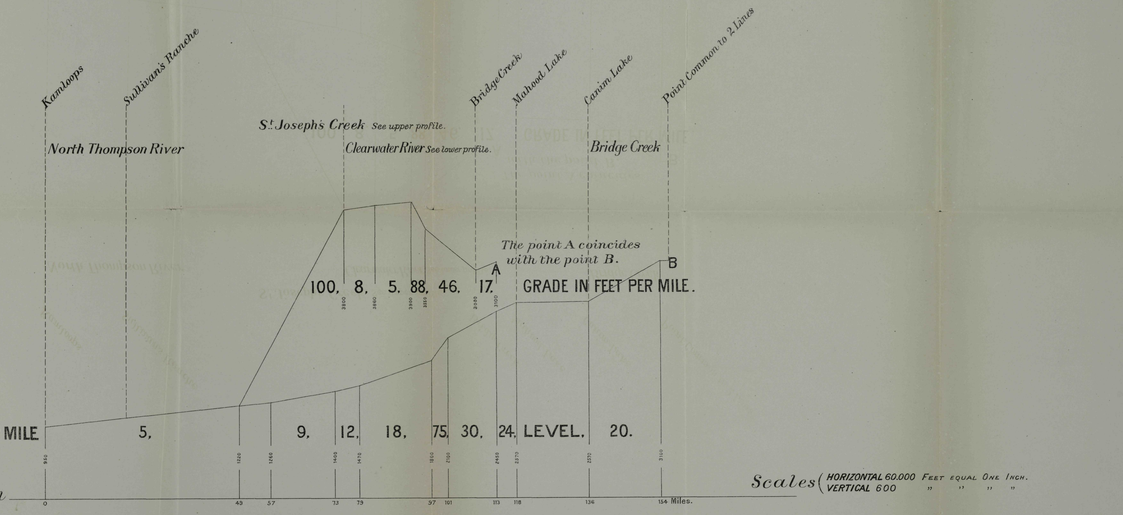
It will be seen from the foregoing, that this portion of Mr. Marcus Smith's description of the line up the Bonaparte river valley covers a distance of about 40 miles. The profile of this portion of the line (sent from Ottawa) is useful, not only in relation to that same section, but

PROPOSED CARIBOO RAILWAY.

DIAGRAM OF AVERAGE GRADES.



PROFILE OF LINE FROM SAVONA TO BARKERVILLE VIA THE BONAPARTE RIVER
WITH APPROXIMATE GRADES.



PROFILE OF LINE FROM KAMLOOPS TO BARKERVILLE VIA THE NORTH THOMPSON RIVER AND
ST. JOSEPH'S CREEK, ALSO BY THE NORTH THOMPSON AND CLEARWATER RIVERS,
WITH APPROXIMATE GRADES.

Higgins Lith. Co. The Colonist Victoria, B.C.

N. F. Bell M. I. C.E.

also as a fair sample of a large proportion of the work to be found upon the whole distance, from the south terminal point to Barkerville, by the Bonaparte route. I am, however, inclined to believe that the steepest grades, as set forth in the foregoing description, may be considerably reduced without materially increasing the cost of the work.

The country between the plateau of the Bonaparte, at the 86th mile (see plan) and the 142nd mile, is of the same general character. It may be summarized by calling it an undulating plateau offering much choice of ground, requiring a thorough survey, but quite capable of affording in return therefor a line of economical traffic capacity, without heavy works. The only crossing of any magnitude in the whole of this distance, is that of the Bridge creek, near 100th mile (see plan). From the 142nd mile to the 150th, it would be possible to descend to the valley of the Horsefly river by Moffat creek, one of its tributaries; but the descent would necessitate a rough line with heavy works, steep grades, quick curves, and a low standard of economical traffic capacity. A good line may be run, reducing the grade or extending the descent over a greater length, by following the western benches of Moffat creek, which are singularly free from ravines; striking the head waters of the six mile creek near the 148th mile by plan, the descent by which establishes the line by way of Beaver river, as laid down upon plan herewith. Going down the valley of the Beaver river from the head-waters near the 148th mile, the valley descends in easy gradations by low benches enclosed between sloping side-hills with a straight general direction. Below the 160th mile, the valley contracts in width for about two miles, the bottom bench levels rise, and their western slopes encroach upon the creek channel, but not enough to necessitate the introduction of heavy grades or expensive works. Thence all the way down to the farm and ranche of E. Ti & Co., at the crossing of the Cariboo trail, near the 168th mile by plan, the general character of the valley is wide and the slopes are easy, as before described.

The east side of the valley seems to be the best for a line all the way down.

Mr. Marcus Smith, in his report upon the suveys of the Canadian Pacific Railway in 1873, thus describes the valley of the Beaver river:—

"On the second day's journey the trail crossed a large farm in the Beaver valley near "which we camped; this valley, as far as I could see each way from the adjoining hights, "looked remarkably favourable for a line of railway."

Elsewhere Mr. Marcus Smith says—

"The Beaver lake is the most important of these valleys. In some places it is fully a "mile in breadth, and contains some good agricultural lands and abundance of meadow grass. "On the slopes are some patches of inferior bunch grass; but we are here on the northern "verge of the bunch grass belt. This valley joins that of the Quesnelle between thirty and "forty miles above the mouth of the latter, and in connection with the Horsefly valley affords "a good line for a railway between the Clearwater and the Fraser rivers."

Having described the character of the Beaver valley, I will take up next that portion of Quesnelle river valley between the Forks of Quesnelle and the mouth of the Beaver river, a distance of about eleven miles by plan. The valley of Quesnelle river is flanked by high benches enclosing bottom flats upon alternate sides, with here and there a bluff or slide as the river curves into the slopes of the valley in its passage from side to side. There is a crossing of the river to be made in this section, which may be located at such a point as to admit of the line being kept upon the best side of the river all the way up to the Forks. The works upon this section need not be extra heavy, and there are three good river crossings in the first seven miles below the Forks of Quesnelle.

From the 207th mile at the Forks, thence ascending the North Fork river, the valley is generally wide enough for a line of railway without necessitating a large percentage of side-hill work. The general direction of the valley is very straight, permitting of good curvature; the quantity of rock upon a low level line would not likely exceed 25 per cent. of the total excavation; nor would this be probably more than 25,000 cubic yards per mile for a low level line. The total length of the North Fork river is about 13 miles; thence to the mouth of Keithley creek the work will not be heavy, the lake affording a uniformly good foreshore, with room enough for a line below the side-hill to the 220th mile at Keithley mouth. There is good bridge timber upon Cariboo lake and the North Fork river. Exposures in the banks of the latter, made by grading the trail on side-hill, disclose heavy deposits of gravel proved to be auriferous by the resident Chinese mining in that vicinity. From the 220th mile by plan, still going north, I followed the regular trail to Barkerville, up Snowshoe, and down Martin creek, thence to the head-waters of Swift river and Antler creek, down Antler creek to the

Cunningham creek pass at the 254th mile by plan herewith. Arrived at this point I was surprised to find that there existed a well-known trail between Cunningham and Antler creeks, with a very slight elevation between the two creeks.

Having made further enquiry from the guide who was breaking track for me (and who knew the country well), as to whether there was any connection between the Valley creek (which is a direct lead from the south into Barkerville) and this pass; he replied in the affirmative, and so soon as we rose up out of Antler creek and got upon the upper benches, it became very apparent that such was the case. The key of this position seems to be the getting of a good line with a continuous rising grade by way of Swamp river and Cunningham pass to Antler creek.

Once in Antler creek, by running up grade down stream, the upper benches of Antler creek are reached at the point where Antler turns sharp to the eastward. The production of the same line north to Barkerville, by way of the Valley creek, presents no difficulty. There would, therefore, be only one summit to pass over on this line between the mouth of the Beaver river and Barkerville (see diagram of grades). From the 220th mile, at the mouth of Keithley creek, there will be required a continual ascent, at the rate of about 53 feet per mile, for 33 miles, to catch the level of the Cunningham pass and rise out of Antler to the Valley creek. The grades of nature are not uniform throughout this section, the Swamp river being a sluggish stream, while Cunningham creek has a rapid fall. There is a rock cañon, some seven miles in length, near the head of Cunningham creek, through which the grade of the creek (owing to inequality of fall) must gain upon that of the line. This portion of the line may result in a rather heavy section; the rest of the distance between the 254th mile and Barkerville the work would not be heavy.

It may be said of the whole distance, from the south terminal point to Barkerville, by way of the Bonaparte route, that even including two truss bridges, one over the Thompson and another over the Quesnelle river, the bridging will be found a very insignificant percentage of the total cost.

There is timber enough for constructive purposes, to be found at reasonable distances apart, all the way from the Bonaparte summit to Barkerville.

For the section immediately south, the bridges might be built from the end of the track, as they were upon Mr. Onderdonk's contracts in British Columbia.

The total distance from Port Van Horne to Barkerville, with an allowance of 10 per cent. added to cover local curvature, will be 288 miles.

Having described the line by way of the Bonaparte valley to Barkerville, the next point in order of numeration, according to instructions will be the lines by way of the North Thompson river.

DESCRIPTION OF TWO LINES.

The plan shows two lines, one rising by the valley of St. Joseph's creek to the central plateau, 100 miles in length, from Kamloops to its junction with the Bonaparte route; the other by way of the Clearwater river and Bridge creek, 156 miles in length, from Kamloops to its junction with the Bonaparte route. The mileage of the Bonaparte route, measured from Port Van Horne to the intersection with these two lines, will be respectively 93 and 105 miles.

A comparison of distances to a common point will, therefore, stand as follows :—

	Miles.
From Port Van Horne to a common point opposite Bridge Creek House, by the Bonaparte river route	105
From Kamloops to the same point, *viâ* St. Joseph's creek	113
" " " " the Clearwater river	156

These are plan distances, without any percentage for local curvature as hereafter added on.

All these lines are included in Mr. Sandford Fleming's reports on the surveys of the Canadian Pacific Railway made to the Dominion Government.

As the North Thompson river section, from Kamloops to the 76th mile, is applicable to both lines, I will describe that portion by stating that the North Thompson river as a route for a line of railway, is *per se* a noble river for constructive purposes, capable of a high standard of economical traffic capacity, with works lighter than medium; but the very rapid falls, the rough rocky, narrow and circuitous character of its western tributaries, involve costly works, long maximum grades, quick curves, and a low standard of economical working capacity, in

order to utilize the North Thompson river as an approach to the central plateau. Mr. Marcus Smith describes the line by way of St. Joseph's creek as follows :—

"The point at the outlet of the lakes last alluded to is 3,707 feet above sea level at the "head of a deep ravine through which the stream that carries off their surplus waters flows into "the North Thompson river. The line follows the slopes or benches on the east side of the "ravine nearly 14 miles, with a continuous falling grade of 2 feet per 100, crossing five rocky "spurs, averaging 750 feet in length, that will have to be tunnelled. The rest of the work "will be light.

"From this the line deflects northward, descending obliquely the western slope of the "Thompson valley till it reaches the bottom ; and crossing the river joins the line surveyed in "1872, about six miles below the mouth of the Clearwater.

"In this last length of 12 miles the grade continues to fall at the rate of 2 feet per 100 "for nearly 9 miles, with only one break of a quarter of a mile of level, making altogether a "continuous grade of 106 feet per mile for 23 miles.

"The westerly slope of the Thompson river is here very irregular and broken, with deep "lateral ravines and rocky spurs shooting down to near the bottom of the valley, and the work "will consequently be heavy, requiring on the line surveyed two tunnels, one 4,300 feet and "the other 8,000 feet in length."

The distance from Kamloops to Barkerville *viâ* St. Joseph's creek, including 10 per cent. for local curvature, is 300 miles.

Elsewhere in the same report, dated 1874, Mr. Marcus Smith describes the line by way of the Clearwater river and Bridge creek as follows :—

"The point at which this line commences is 1,397 feet above sea level. From this it "follows nearly a north-west course across the angle between the two rivers, and in less than "two miles strikes the left bank of the Clearwater, which it follows up almost due north four "miles ; then it crosses the river with 200 feet of bridging, and follows up the right bank 18¼ "miles to the north of Bridge creek, with an average rise of 18½ feet per mile. On the whole "of this distance the line is very difficult, and to keep the quantity of rock excavation within "moderate limits, curves of 5 degrees, 1,146 feet radius, will have to be frequently used, and "we have put in three curves of 955 radius and two of 818 feet radius. Even with these "we have had to adopt steep grades, of which there are eleven miles exceeding 1 foot per 100, "the highest of which is 1.5 feet per 100 for four miles.

"With these curves and grades the cuttings are reduced to shore lengths, few of them "exceeding 1,000 feet, with a maximum depth of 40 feet and diminishing rapidly towards the "ends.

"The line then follows the valley of Bridge creek, on a westerly course, to the outlet of "Mahood lake, about 3½ miles. This is an exceedingly difficult portion ; the valley is narrow, "deep, and tortuous, hemmed in with walls of basalt and trap rock, and the average rise is "1.44 feet per 100, with continuous sharp curves and very heavy rock cuttings, in which is "included a tunnel through rock 1,800 feet in length. There is also a ravine to cross, 2,000 "feet wide and averaging in depth fully 100 feet below grade line.

"Mahood lake is 2,074 feet above sea level and 13 miles in length. The line follows the "south shore, and for the first three miles the grades are easy and the works will be moderate. "It then encounters a bluff of slate rock a mile and three quarters in length. A large propor- "tion of this is a high perpendicular cliff extending into deep water with an irregular face. "In this there would be very heavy rock excavation, including fully a mile of tunnelling. From "this the high bench at the head of the lake can, by a slight deviation of the present line, be "reached with grades not exceeding 1 per 100, but with rather heavy works.

"Between Mahood and Canim lakes the distance is about five miles, and the line crosses "the connecting stream (60 to 100 feet in width) about a mile below the outlet of the latter, "with moderate works. It then follows up the north shore of Canim lake, 18 miles to its "head. This shore is a serpentine line, requiring frequently curves of 1,000 feet radius, with "undulating grades, but the work will be rather heavy as the cuttings, though of no great "extent or depth, will be chiefly in slate rock.

"The altitude of this lake is 2,550 feet above sea level. Following up the valley of Bridge "creek the distance is 18 miles to the water-shed between the Thompson and Fraser rivers, "3,104 feet above the sea level."

The distance from Kamloops to Barkerville by this route will be 344 miles, including 10 per cent. added on to cover local curvature.

Mr. Mahood, who made the survey of the Clearwater route, and to whom I am indebted for the reproduction of the plan (burned in the fire in the Canadian Pacific Railway offices in 1873), explains that had he used the same curvature subsequently found necessary on portions of the Canadian Pacific Railway, he could have shown a better profile, and I have no doubt that this explanation is correct.

Mr. Mahood's line was afterwards improved by Mr. H. J. Cambie, but where and to what extent I cannot say, as the profiles and report are not at hand.

This line is, however, under a disqualification as regards length, independently of other objections, being 56 miles longer than the line by way of the Bonaparte river.

Recapitulating the lengths of the three routes they will stand as follows, including 10 per cent. allowance of distance to cover local curvature :

	Miles.
From Kamloops to Barkerville, *viâ* North Thompson river and St. Joseph's creek	300
From Kamloops to Barkerville, *viâ* North Thompson and Clearwater rivers	344
From Port Van Horne to Barkerville, *viâ* the Bonaparte River	288

Having described all three routes, the next point in order of numeration, reverting to instructions received, is a comparative statement of cost. Before making any estimate I would say that as there was a variable depth of snow upon the ground at the time I made this exploration, ranging from seven inches at Kamloops to seven feet at the head of Antler Creek, it was impossible to see the rock surface upon the whole distance passed over, as might be seen by exposures in the summer time. There are, however, other indications by which rock may be known, and I see no reason to think that this disability would cause any invidious distinction in favour of any particular route. So far as the information at hand will avail to compare cost, I will estimate by knowing the cost of similar work in a similar class of country. In making an approximate estimate, I presuppose that the work will be carried out as economically as good modern practice upon similar ground will admit of ; that the guage shall be 4 ft. 8½ in., and that the estimate of cost is complete in all respects with water service, stations, rolling stock, and equipment of all kinds ready for traffic.

Calling now the route by way of the North Thompson river and St. Joseph's creek No. 1 ; that by way of the North Thompson and Clearwater No. 2 ; and that by way of the Bonaparte No. 3 ; and affixing their respective mileages as before, I estimate their respective cost complete as follows :—

Route No.	1	300	miles—	Nine million dollars.
,,	2	344	,,	Ten and one half million dollars.
,,	3	288	,,	Seven and one half million dollars.

In considering what amount of rolling stock should be included in the above estimate, I have added to the number of engines and flat cars necessary to ballast 288 miles in two years time passably well, cars enough of other descriptions to accommodate any proportion that the traffic would be likely to assume during the first year of operation. In this connection I may say that the total shipments of all kinds from Ashcroft for the upper country during the year 1886 were, very approximately, one million five hundred thousand pounds; but this amount must not be understood to cover anything like the total consumption for a year of the mining districts, which are very largely supplied with staple products from the upper farming country in British Columbia.

Reverting to the cost of construction, I have neither seen nor heard of any snow slides within the section of country that this line is laid down to pass through; and no greater difficulty from snow need be apprehended than the accumulation to be got by heavy ploughing in bad winters, which are, fortunately, far apart. The maintenance of traffic upon the Cariboo waggon road through the winter months, has given a very good approximate knowledge as to what amount of inconvenience may be expected from heavy snow-fall without slides or drifts. The Barkerville section of the line is circuitous, but the routes laid down are those of nature, and to follow the routes provided by nature in the northern portion of British Columbia, is not a bad guide to go by until experience points out a better. It is further to be noted, that in a mining district the most business may be got upon the longest line, provided the whole of the circuitous portion is located in a highly gold-bearing district, such as that (through which the north end of the line as laid down passes) has proved to be. By going through the Beaver

valley, a good agricultural and grazing country, in contiguity with the mining belt upon all sides, business would be likely to result, and a naturally very attractive country to induce settlement during the early days of constructive operations.

The line that I had first intended to explore north of Bridge creek was that following Captain Mitchell's trail to the Horsefly river, down that river and along the west shore of Quesnelle lake, down the South Fork river and up the North Fork.

In order to utilize this line some means of entering the Horsefly river must be found at a point far south of the 148th mile by plan. I went up the South Fork for four miles, and came back with the conviction that I had seen the large proportion of half a million dollars worth of work. Still there might be found some way of avoiding this objectionable work in connection with a line by way of the Horsefly river. The Horsefly river was explored by Mr. Joseph Hunter, C. E., for a long distance south of its discharge, and found to be practicable for a line of railway. The Blackwater river has never been condemned as a possible means of rising from the Clearwater river to the central plateau. If it were possible to join the Blackwater with the Horsefly river, this combination might afford a good direct route, other conditions being equally favourable, and it would pass through a very promising mining country. Possibly a high level line might be run by the northern end of Quesnelle lake, dropping into the present line by plan about the 230th mile. Such an exploration is worth investigation, as it would shorten distance considerably; although from all we now know it would be premature to be very sanguine about the results.

With reference to the southern portion of the line, I may direct attention to the fact that the Bonaparte river possesses an advantage over all other routes as a means of access to the central plateau of British Columbia, owing simply to the length of its course and the general uniformity of its grade over any given distance. Taking two points in the same latitude, say 51 degrees and 20 minutes, one point situate on the Bonaparte, and another on the North Thompson river, it will be seen that the point upon the Bonaparte is nearly three times higher above sea level than the point upon the North Thompson, which shows the inferiority of the latter as an approach to high contiguous points compared with the Bonaparte river. In reference to the question of which of the routes reported on would best meet the requirements of the country, other than those of mining, it should be remembered that the best portion of the North Thompson valley is already navigable. There is, therefore, no great object to be gained by further serving that district which is already best served. The interests to be served by the Bonaparte route preponderate over those of the North Thompson; and the development of the North Thompson district, outside of the valley of the river itself, is not capable of much lateral expansion. There are many good summer ranges upon the head-waters of the Bonaparte, and between there and Canim lake, capable of considerable future development.

The farming and grazing interests between Cache Creek and Quesnellemouth are considerable even now, and under the stimulus that would be afforded those districts by any increase of activity in mining operations (such as would result from the building of a line of railway into the Cariboo mines), it is reasonable to suppose that a very considerable market for produce of all kinds would be the result. A large proportion of the present consumption in the mining districts is supplied from points not very remote from the Bonaparte route as laid down; and, as before stated, this route passes through a region capable of considerable agricultural and grazing development. I would direct attention to the fact that a road of about 8 miles in length would join the line as laid down with the navigable waters of Quesnelle lake, which would open up to grazing, mining and agricultural development a shore line of about 200 miles in length in the very heart of a district in which very encouraging prospects have been found; known also as possessing in some places very nutritious natural grasses.

It is not difficult for any one who has seen the massive quartz ledges, and who knows the almost inexhaustible wealth of the Cariboo gold-fields, to foresee, beyond doubt, that the result of the building of a railroad into that section of country could be no other than the creation of a large business within a very limited time after the operating of the road commenced. It may be said that this is only an assertion, but it is an assertion capable of analogical proof, the only kind of proof available in the early stages of such an enterprise.

The State Mineralogist of California says in his report for the year ending June, 1886:—

"Mines can now be worked in California at a much less cost than during the delirium of "the first gold excitement, for the reason that transportion, provisions, labour, and fuel are "cheaper, and every ounce of gold obtained is practically of double value.

"These facts are well known to intelligent miners in the State, and our mines are being "better worked than ever before.

"New quartz veins are being taken up wherever they can be found, and there are in- "dications of a new era in mining which it is hoped will cause renewed prosperity in the State, "even if we cannot utilize our vast deposits of placer gold.

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"Within a few years railroad lines have been extended and settlements advanced. Ores "that could only be worked if they would yield from 25 to 50 dollars per ton, are now found to "be rich, as they can be mined and milled at a very reduced expense. Dump piles formerly "considered worthless are now valued at many thousands of dollars. Tailings allowed to go "to waste in former years are now being prospected and assayed. The concentration of these "tailings will furnish employment for many men in the near future."

In this connection it is worthy of notice that a large percentage of the fifty million dollars worth of gold hitherto taken out of British Columbia came out of Williams Creek, and yet it is a habitual assertion by all British Columbia miners, that there is as much gold in the bottom of Williams Creek to-day as the amount that has been taken out.

The same authority above quoted says—

"The value of gold in the tailings not only of the quartz, but the hydraulic mines, is "something enormous. It is considered by the most practical miners in California that at "least one-half of the gold in placer mining is lost—or rather not saved."

There are already open to inspection in the Cariboo region quartz ledges varying in width from seven to seventy feet, and ranging in depth from 20 to 180 feet, from each of which the average assay of last year, recorded in one assay office in Barkerville, was very satisfactory.

If then these ledges were in a further state of development (as they very soon will be, owing to the aid afforded by your Government), who could doubt the proportions that business, upon the only road serving this district, would be likely to assume.

Seeing that your Government, after considering well the responsibility that attaches to aiding by loan, upon certain conditions, the development of quartz mining, has seen fit to take that step, it would naturally appear that no better proof or greater confidence as to what the future of quartz mining in British Columbia is likely to become could well be displayed, nor any stronger argument used in forwarding the building of a road into that district which has commanded confidence enough to gain so valuable a concession.

But the quartz ledges now open in British Columbia are not a large percentage of those known amongst practical miners to exist in the Cariboo district, and if cheap transportation to these mines were only available, then, by a parity of reasoning, no long time would elapse before the same activity in mining in British Columbia would take place that followed upon the construction of railways in California.

There is at present a resident population of some 250 to 300 Chinese at the Forks of Quesnelle river; one of the oldest mining camps in British Columbia. These miners make a good living by the following expedients, which are only some amongst many of a kindred nature:—By standing on a raft and lifting gold-bearing gravel out of the bed of the river with a long handled shovel; by carrying water up hill on their backs from the river to wash auriferous gravel taken from the river benches; by building wing-dams (good only for one season) to lower the water inside and below the dam, and by using the time-honoured rocker.

If they can and do make money by the use of such expedients, how much of the total pay there can they have taken out, and what a harvest remains to more intelligent methods of mining upon a river with a fall of over 40 feet per mile.

In concluding this report, I would say that I received every assistance from the Agents of the Local Government at the Forks of Quesnelle and at Barkerville that it was in their power to render. I arrived at the Forks of Quesnelle with a delapidated following and camp outfit, and found Mr. Stephenson's assistance and knowledge of the country timely, and very valuable in preparing to start for Barkerville.

I have, &c.,

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